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Effect of vermiwash, panchagavya and weed extract on growth, yield and seed quality parameters of cluster bean (*Cyamopsis tetragonoloba* (L.))

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Abstract

Cluster bean (*Cyamopsis tetragonoloba* L.) popularly known as guar is a drought tolerant, deep-rooted, annual legume is grown for Vegetable, Food, Fodder, Green manure, Gum and as a seed. The fortification of seeds for better Growth and Yield has become important and emphasized. The study was conducted to determine the — Effect of Vermiwash, Panchagavya and Weed Extract on Growth, Yield and Seed Quality Parameters of Cluster bean (*Cyamopsis tetragonoloba* (L.)). The experiment was carried out at Field Experimentation Centre of the Department of Genetics and Plant Breeding, Sam Higginbottom University of Agriculture, Technology & Sciences, Prayagraj (UP) during Kharif-2019. The experiment was laid out in Randomised Blocked Design and comprised of 13 treatments and 3 replications. The treatments were T₀ (Control), T₁ – vermiwash 5% @ 12hrs, T₂ - vermiwash 10% @ 12hrs, T₃ - vermiwash 15% @ 12hrs, T₄ - vermiwash 20% @ 12hrs, T₅ – panchagavya 5% @ 12hrs, T₆ - panchagavya 10% @ 12hrs, T₇ - panchagavya 15% @ 12hrs, T₈ - panchagavya 20% @ 12hrs, T₉ – weed seed extract 5% @ 12 hrs, T₁₀ - weed seed extract 10% @ 12 hrs, T₁₁ – weed seed extract 15% @ 12 hrs, T₁₂ - weed seed extract 20% @ 12 hrs.

Keywords: Cluster bean, treatment combinations, fortification, growth, yield

Introduction

Cluster bean (*Cyamopsis tetragonoloba* (L.)) also known as gaur, guwar, or guvar bean is an annual self-pollinated leguminous crop and belongs to the family Fabaceae (Hymowitz and Matlock, 1963) ^[9]. The origin of the Clusterbean has been suggested in India and Pakistan and tropical Africa (Vavilov, 1951). It is assumed to have developed from the African species *Cyamopsis senegalensis*. It is a drought tolerant, deep-rooted, annual legume, used as vegetable, Seed, Green manure, Fodder. It is also used for making gum, which is used in Oil refineries and Petroleum Industry. It is an important short duration (90120 days) crop of high nutritive value having high nitrogen fixing ability and is grown during kharif as well as summer seasons in arid and semi-arid regions of India. Cluster bean is cultivated mostly in India, Pakistan, USA, Italy, Morocco, Germany, and Spain (Punia *et al.*, 2009) ^[13]. Young pods are good source of protein, carbohydrate, vitamins ('A' and 'C'), and important minerals like calcium and iron (Kumar and Singh 2002) ^[10]. The endosperm of guar seed contains an important hydrocolloid named galactomannan. Mucilaginous seed flour is used for making guar gum (galactomannan) utilized in textile, paper, cosmetic and oil industries throughout the world and is a useful absorbent for explosives (Smith, 1976). The galactomannan due to its thicker, binder and stabilizing specific qualities, has a diversified industrial applications *viz.* paper, food, cosmetics, explosives, mining, petroleum, pharmaceuticals and well drilling etc. Recent rise in demand of guar in International market as a gum is attributed to its use in mining industry and petrochemical, where its use as viscous agent has been revolutionized the petrochemical industry and resulted in considerable increase in global natural gas production (Falasca *et al.*, 2015) ^[6].

The cluster bean gum used as: (i) agriculture – as anticrushing agent and water retainer, (ii) petroleum industry – as gelling and thickening agent, (iii) textile and juice industry – for sizing, as thickener and stabilizer, (iv) waste water purification – as a gelatinising agent, (v) explosives – waterproofing agent, (vi) mining, and (vii) pharmaceutical industries (Girish *et al.*, 2012) [17]. Because of its industrial value, guar seed has great demand from foreign countries like USA, Germany, Britain, Italy, France, UAE, China, Japan, South Africa, Hong Kong and Australia etc. Further, cluster bean meal (husk and germ) are used as high protein cattle feed (Rai and Dharmatti, 2013) [14].

India is the major guar producer accounting for 80% of the world's production. In India, guar is being grown mainly in arid and semiarid regions of North Western states of Rajasthan, Gujarat, Haryana, Punjab, parts of Uttar Pradesh, Madhya Pradesh and Tamil Nadu. It is grown approximately in an area of 3.44 million ha, with a production of 2.21 million tonnes and has productivity of 644 kg/ ha (Directorate of Extension and Statistics, 2012) [14]. Rajasthan occupies the largest area under guar cultivation (82.1%), followed by Haryana (8.6%), Gujarat (8.3%) and Punjab (1%) which in turn produced 64, 22.12 and 2% guar seeds, respectively (Pathak *et al.*, 2010) [12]. Rajasthan is the largest producer accounting for 70% of total guar production of the country followed by Gujarat, Haryana and Punjab. The productivity of cluster bean ranges from 474 kg/ha in Rajasthan to 1200 kg/ha in Haryana (Ahlawat *et al.*, 2013) [1].

Materials and Methods

The Research study was conducted at experimental research field, Department of Genetics and Plant Breeding, Naini

Agriculture Institute, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj during kharif-2019. The experiment was carried out at Field Experimentation Centre of the Department of Genetics and Plant Breeding, Sam Higginbottom University of Agriculture, Technology & Sciences, Prayagraj (UP) during Kharif-2019.

The source of seed material was obtained from Indian Institute of Pulse Research, Kanpur and the experiment was conducted in Randomized block design (R.B.D) with three replications and the genotype used in this Experiment was GR-6. The data was collected on five randomly selected plants from each plot and measurement of different observations was recorded. The treatments were represented as T₀ (Control), T₁ - vermiwash 5% @ 12hrs, T₂ - vermiwash 10% @ 12hrs, T₃ - vermiwash 15% @ 12hrs, T₄ - vermiwash 20% @ 12hrs, T₅ - panchagavya 5% @ 12hrs, T₆ - panchagavya 10% @ 12hrs, T₇ - panchagavya 15% @ 12hrs, T₈ - panchagavya 20% @ 12hrs, T₉ - weed seed extract 5% @ 12 hrs, T₁₀ - weed seed extract 10% @ 12 hrs, T₁₁ - weed seed extract 15% @ 12 hrs, T₁₂ - weed seed extract 20% @ 12 hrs.

Result and Discussion

Based on the present study, it can be concluded that the treatment combination T₄ (vermiwash 20% @ 12 hrs) is recommended as the best treatment combination for obtaining the better growth, yield and quality parameters in cluster bean. Plant growth parameters such as Days to 50% flowering, plant height, number of branches per plant, Number of pods per plant and yield parameters such as Number of cluster per plant, Number of pods per plant and seeds per pod. Mean performance of the plant growth parameters is shown in table-1.

Table 1: Mean performance of growth and yield parameters in cluster bean

Treatments	Field emergence	Days to 50% maturity	Plant height (cm)	No. of branches/plant.	No. of pods/plant.	No. of seeds/pods.	Seed yield/plant (g)	Seed yield/plot (g)	Biological yield
T ₀	70.00	44.00	97.21	7.27	45.73	6.67	3.11	40.12	156.47
T ₁	79.67	39.67	99.48	8.67	57.67	7.33	4.31	55.59	187.90
T ₂	83.00	40.33	111.05	8.90	62.00	11.13	7.05	90.91	285.44
T ₃	86.33	36.67	114.54	9.43	66.40	12.07	8.14	105.06	304.68
T ₄	88.67	35.67	116.33	9.97	68.33	12.63	8.81	113.59	318.04
T ₅	82.33	38.67	110.67	8.43	57.00	10.67	6.24	80.47	273.60
T ₆	77.00	42.37	103.66	6.33	58.33	8.67	5.16	66.61	216.47
T ₇	80.33	42.93	110.07	8.73	60.67	10.90	6.75	87.04	278.53
T ₈	85.67	37.67	113.83	9.10	65.67	11.67	7.88	101.62	309.94
T ₉	78.00	43.67	108.44	7.67	49.37	8.67	4.37	56.34	211.83
T ₁₀	80.33	38.40	112.67	8.33	52.33	9.33	4.98	64.28	231.41
T ₁₁	78.33	40.33	101.55	8.67	54.67	8.10	4.52	58.37	193.77
T ₁₂	74.67	42.67	110.43	8.33	56.33	9.67	5.56	71.70	249.50
Mean	80.28	40.23	108.45	8.45	58.04	9.81	5.91	76.28	247.51
CV	3.06432	9.03778	1.34398	7.25365	2.78559	12.6003	13.1245	13.1245	13.211
CD	2.39504*	3.77519	1.43923*	0.61634*	1.64418*	1.33626*	0.86158*	11.1144*	35.8002*
SE. m	1.42125	2.24025	0.85406	0.36574	0.97568	0.79295	0.51127	6.5954	21.2443
SE. d	1.16044	1.82915	0.69734	0.29863	0.79664	0.64744	0.41745	5.38512	17.3459

* Significant at 5% level of significance.

Conclusion

Treatment combination T₄ (vermiwash 20% @ 12 hrs) has maximum performance in all the plant growth and yield attributing characters and seed quality parameters it was followed by T₃ (vermiwash 15% @ 12 hrs) and least performance was given by T₀ (control) while compared with the other treatment combinations.

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